

Supplemental materials: Multi-scale analysis of bone chemistry, morphology and mechanics in the *oim* model of osteogenesis imperfecta

Bart ZR, Hammond MA, Wallace JM. Multi-scale analysis of bone chemistry, morphology and mechanics in the *oim* model of osteogenesis imperfecta. *Connect Tissue Res.* 2014 Aug 1;55(S1):4–8. Available from: <http://dx.doi.org/10.3109/03008207.2014.923860>

Table S1: Assessment of chemical properties obtained via Raman Spectroscopy

	WT (n = 6)	<i>oim/oim</i> (n = 5)
MMR Amide I	2.54±0.31	1.92±0.124 ^a
MMR CH ₂	4.34±0.56	3.76±0.24
MMR Amide III	3.77±0.64	3.44±0.22
Amide I:Amide III	1.50±0.12	1.80±0.13 ^a
Carbonate:Phosphate	0.50±0.03	0.49±0.04
Crystallinity	0.054±0.0006	0.052±0.0002 ^a
Volumetric Bone Mineral Density (g/cm ³)	1.58±0.03	1.54±0.05
Crosslinking Maturity (1660/1690)	1.22 ± 0.17	1.03 ± 0.08 ^a

^aSignificantly different from WT data at $\alpha = 0.05$. *Volumetric bone mineral density (vBMD) measured at five posterior sections along the diaphysis via μ CT. Data are presented as mean \pm standard deviation.

Table S2: Micro-scale indentation measures from Reference Point Indentation

	WT (n = 6)	<i>oim/oim</i> (n = 5)
Indentation Distance (μ m)	9.57±0.31	12.53±1.03 ^a
Indentation Distance Increase (μ m)	3.91±0.75	4.60±0.91
Total Indentation Distance (μ m)	31.65±1.07	35.29±1.77
Creep Indentation Distance (μ m)	1.18±0.11	1.36±0.24
Energy Dissipation (μ m)	4.60±0.48	5.28±0.87
Unloading Slope (N/ μ m)	0.27±0.01	0.21±0.01 ^a

^aSignificantly different from WT data at $\alpha = 0.05$. Data are presented as mean \pm standard error.

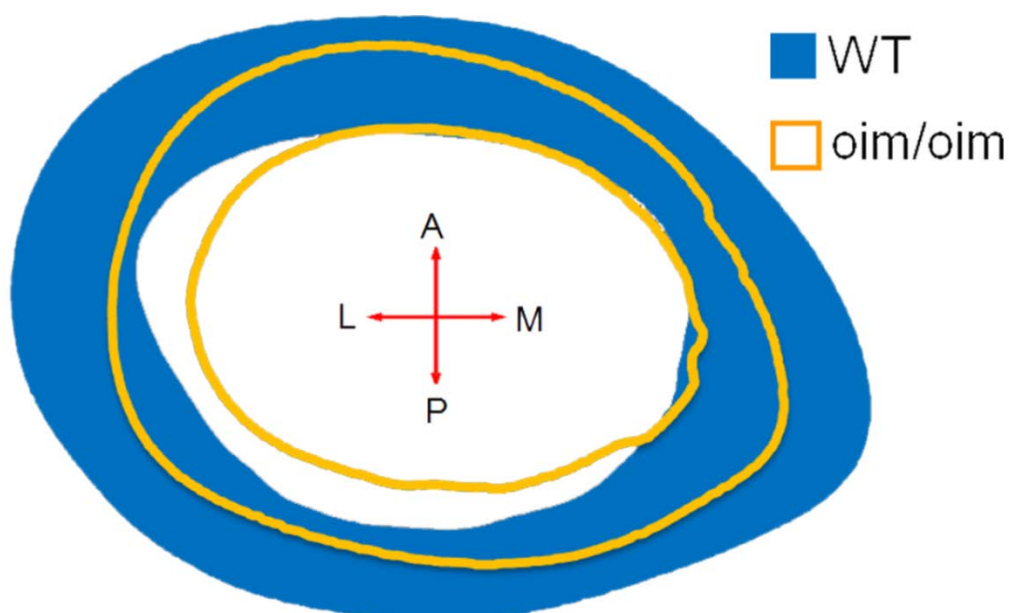


Figure S3: Average midshaft cross-section of oim/oim (yellow) overlaid on the WT (blue) animal. The significant differences in Table S3 are shown to be dramatic changes in structure.

Table S4: Measurements of femur cortical geometry at midshaft site

	WT (n = 15)	oim/oim (n = 9)
Cross-Sectional Area (mm²)	2.002±0.140	1.365±0.186 ^a
Cortical Area (mm²)	1.144±0.081	0.632±0.075 ^a
Marrow Area (mm²)	0.858±0.087	0.733±0.172 ^a
Cortical Thickness (mm)	0.274±0.015	0.178±0.023 ^a
Periosteal Surface (mm)	5.900±0.180	5.000±0.374 ^a
Endocortical Surface (mm)	4.100±0.241	3.789±0.579
AP Width (mm)	1.353±0.047	1.172±0.098 ^a
ML Width (mm)	1.918±0.071	1.536±0.176 ^a

^aSignificantly different from WT data at $\alpha = 0.05$. Data are presented as mean \pm standard deviation.

Table S5: Trabecular analysis in the distal femoral metaphysis

	WT (n = 15)	oim/oim (n = 9)
BV/TV (g/cm³)	35.03±3.98	12.82±7.78 ^a
Trabecular Thickness (μm)	7.36±0.55	5.84±1.05 ^a
Trabecular Separation (μm)	13.35±0.75	23.76±7.67 ^a

^aSignificantly different from WT data at $\alpha = 0.05$. Data are presented as mean \pm standard deviation.

Table S6: Structural and tissue mechanical measurements of femora

	WT (n = 15)	oim/oim (n = 9)
Stiffness (N/mm)	181.18±7.49	69.97±8.40 ^a
Yield Force (N)	18.54±0.55	8.19±0.74 ^a
Ultimate Force (N)	30.28±0.84	9.38±0.88 ^a
Yield Displacement (μm)	118.32±4.63	136.58±7.56 ^a
Postyield Displacement (μm)	391.96±19.82	60.25±26.92 ^a
Yield Work (mJ)	1.09±0.05	0.54±0.05 ^a
Postyield Work (mJ)	10.09±0.51	0.57±0.30 ^a
Modulus (GPa)	2.54±0.16	2.13±0.25
Yield Stress (MPa)	82.68±3.41	64.60±5.70 ^a
Ultimate Stress (MPa)	134.95±5.00	74.74±7.96 ^a
Yield Strain (μϵ)	3.82e4±1704	3.61e4±2635
Failure Strain (μϵ)	1.64e5±6119	5.14e4±5637 ^a
Resilience	1.55±0.07	1.11±0.09 ^a
Toughness	16.06±0.87	1.96±0.65 ^a

^aSignificantly different from WT data at $\alpha = 0.05$. Data are presented as mean \pm standard error.